



What is the State of Knowledge Regarding Impacts on Wildlife from Wind Energy

Wallace Erickson
Western EcoSystems Technology, Inc.
Cheyenne, Wyoming

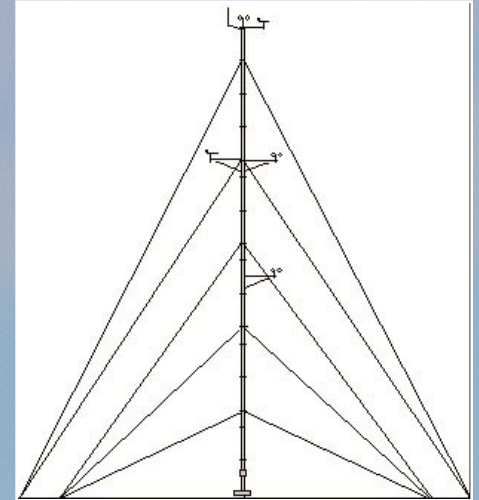
What are the Wind-Wildlife Issues?

- ▣ Avian Mortality
- ▣ Loss of Habitat
 - Direct loss to facility
 - Indirect loss to disturbance
- ▣ Bat Mortality
- ▣ T&E Species Issues

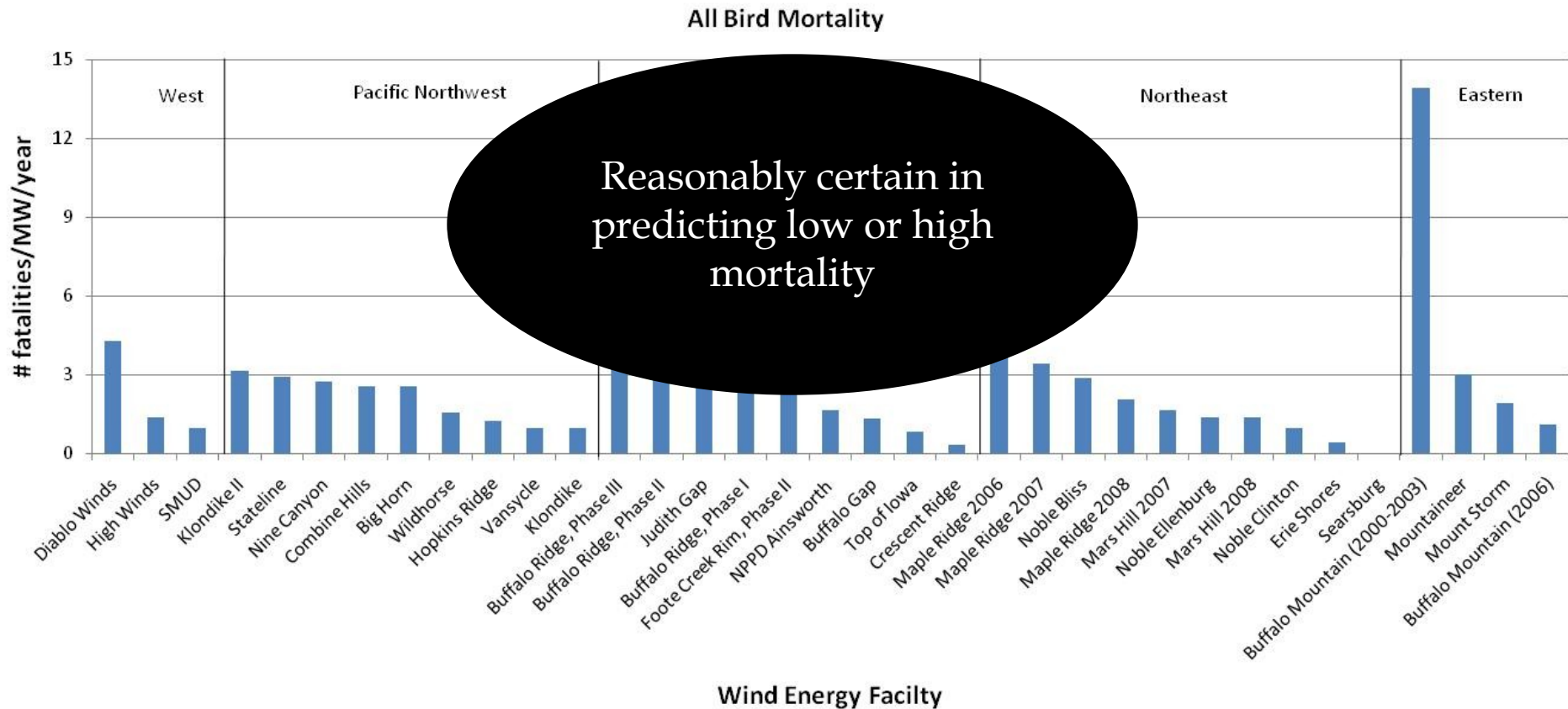


Avian Mortality

- Wind turbine collisions
- Met tower collisions
- Powerline collisions and/or electrocutions
- Vehicle collisions

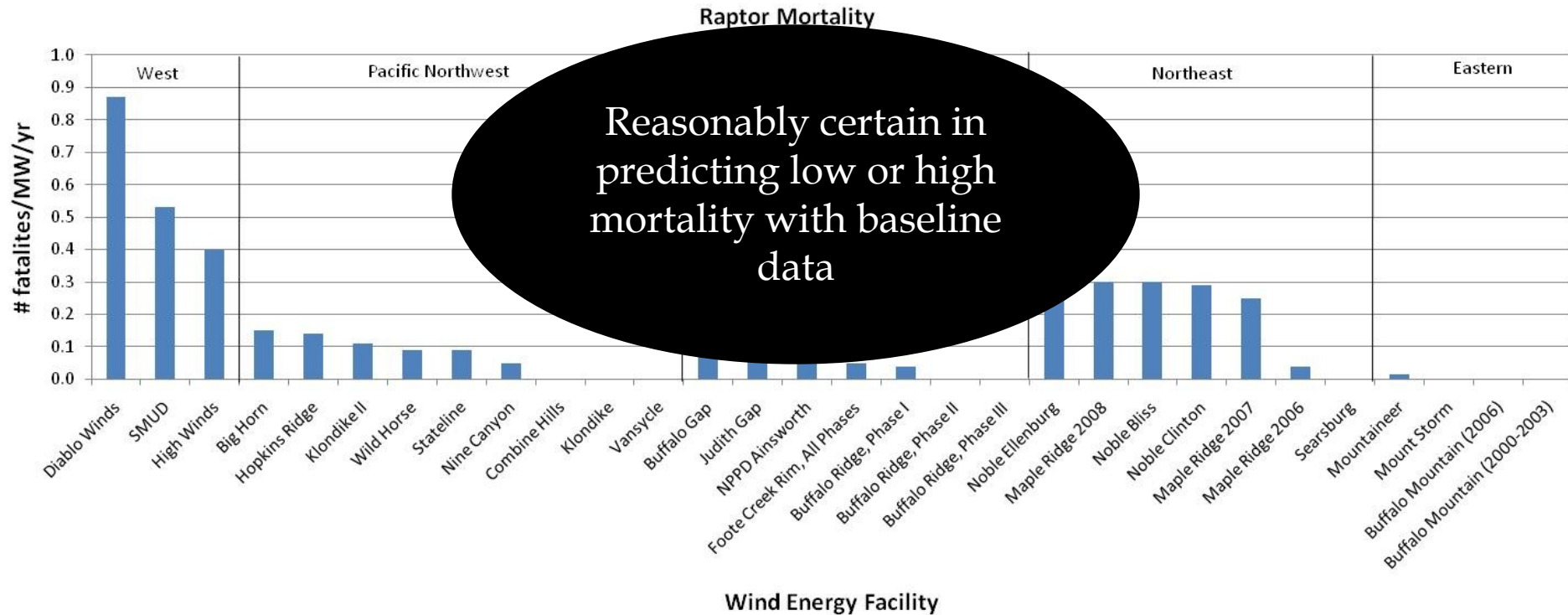


All Bird Mortality Wind Turbines > 660 kw in Size



Raptor Mortality

Wind Turbines > 660 kw in Size



Large vs. Small Turbines

- ▣ Diablo Winds – 660 kW turbines in the Altamont
- ▣ Other Turbines in the Altamont (40-150 kW)
 - All raptors – 63% fewer raptors killed per MW/yr
 - American kestrels - 84% fewer
 - Red-tailed hawks - 34% fewer
 - Golden eagles – none found
 - Burrowing owls - 34% fewer
- ▣ Reference (Altamont Monitoring Team 2008)



Mortality Concerns

Groups/Species to Focus On

- ▣ Raptors
 - Ferruginous hawk
 - Golden eagle
- ▣ Bats
- ▣ T&E



Groups/Species Not Big Concern

- ▣ Songbirds – resident and nocturnal
- ▣ Waterfowl
- ▣ Other waterbirds



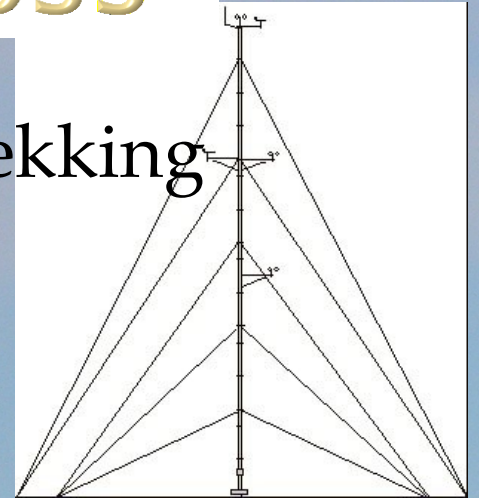
Predicted Impacts Due to Habitat Alteration

- ▣ Temporary (construction) impacts (estimated)
 - 0.4 to 3 acres/turbine
- ▣ Permanent (operations) impacts (estimated)
 - 0.7 to 1 acres/turbine
- ▣ Permanent footprint 1-5%



Indirect Habitat Loss

- ▣ Disturbance/displacement on lekking and nesting from
 - Human activity-noise, etc.
 - Tall structures and rotating blades
 - Overhead powerlines
- ▣ No displacement (e.g, horned lark) or relatively small displacement/disturbance distances for grassland songbirds (e.g, grasshopper sparrow)

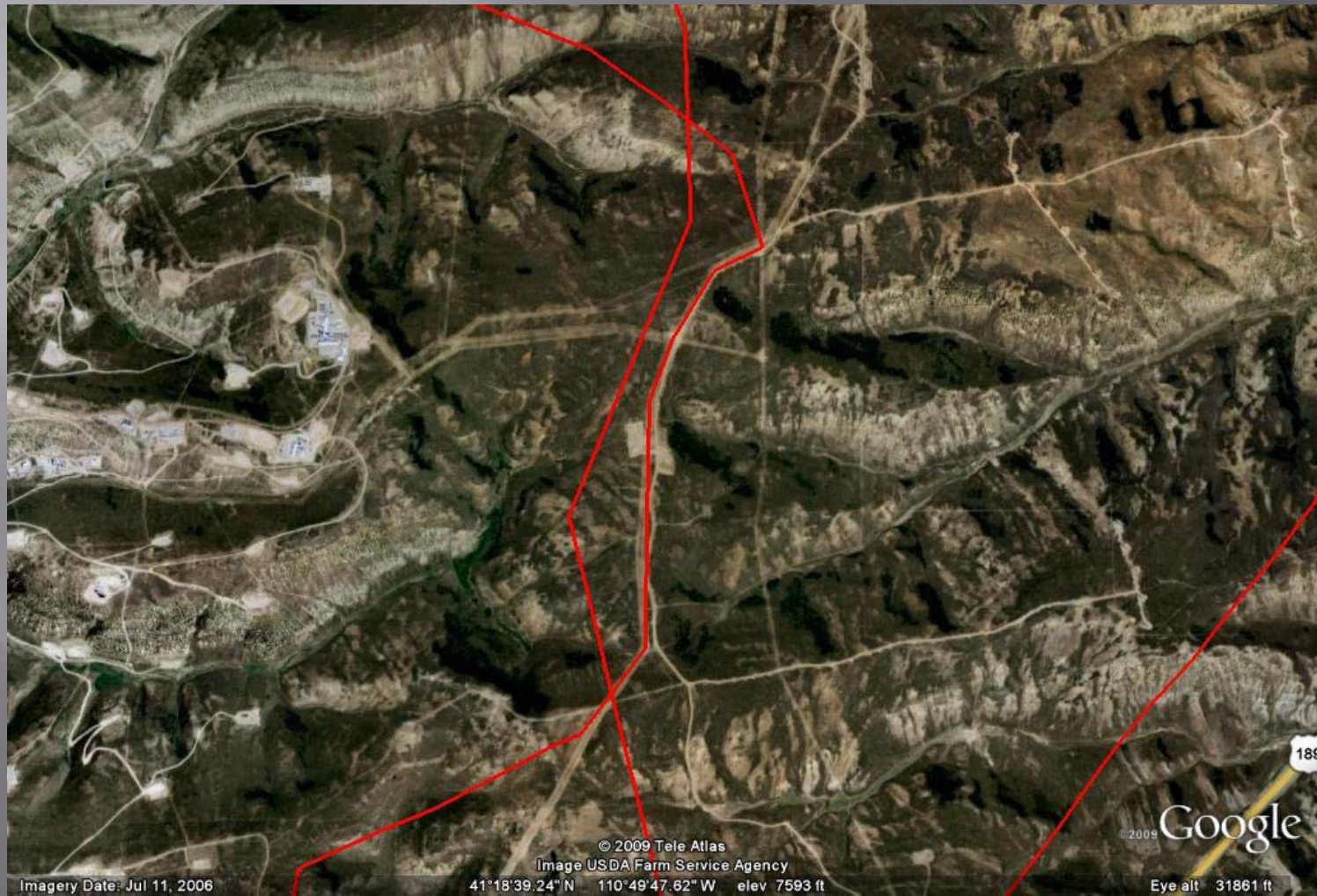


Wind and Gas Disturbance Parameters (from C. Hagen ODFW)



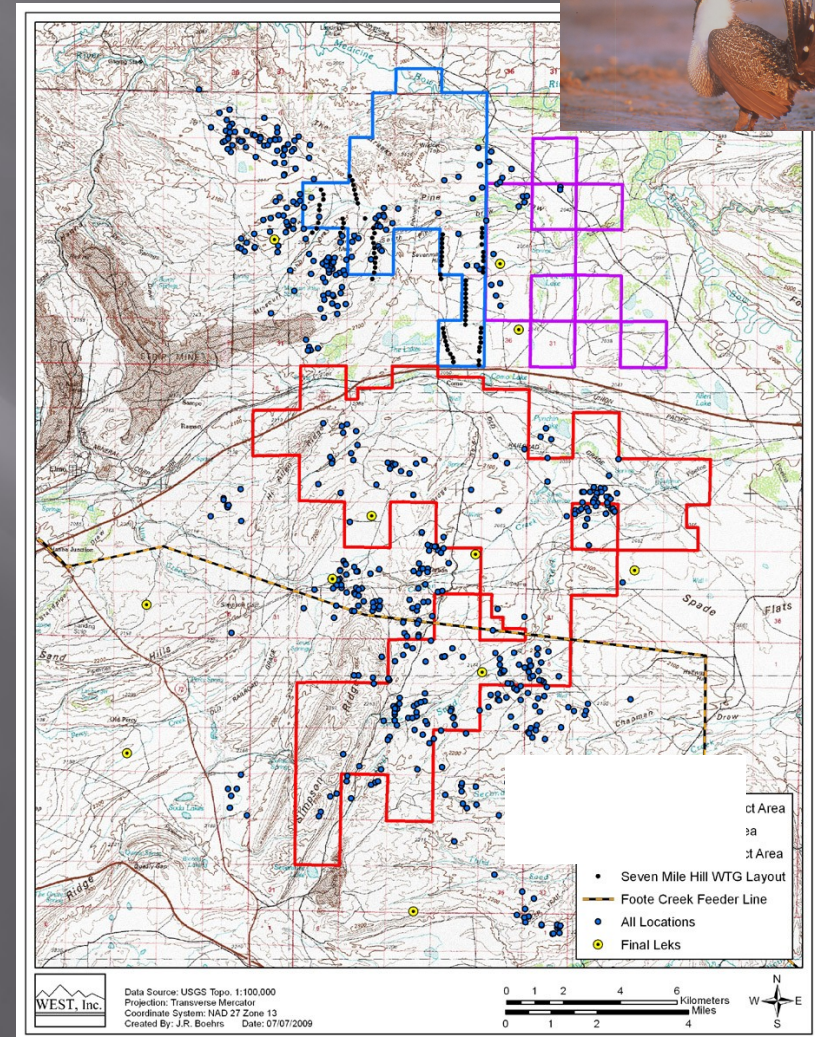
Variable	Gas	Wind
Structure height	4-60 m	66-122 m
Noise @ 0.25 miles	52 db(A)	35 db(A)
Compressor	37 db(A)	NA
Haul roads	40 db(A)	?
Maintenance visits	1 per day-well	1 per 6 months per turbine
Road density	3.13 km / km ²	1.6 km/km ²
% permanent disturbance	5-10%	1%-5%

Gas Field (Left) and Wind Facility (right) Near Evanston, WY



Wyoming Sage Grouse Study

- Preliminary data from an ongoing telemetry study in Wyoming
 - 600 female relocations from April 1 – June 30th
- Many of these relocations near wind turbines and existing overhead lines
- Nine nests within one mile of wind turbines; the four nests closest to turbines were 130 m, 278 m, 388 m, and 486 m from the nearest turbine
- NEED THIS KIND OF INFORMATION COLLECTED LONGER TERM AND AT MULTIPLE SITES TO UNDERSTAND LEVEL OF IMPACT



What are the Wind-Wildlife Issues?

- ▣ Avian Mortality



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- ▣ Bat Mortality



- ▣ T&E Species Issues



Bat fatalities at wind farms have been documented worldwide

U.S., Canada, Germany, Sweden, Spain, Australia

Bat Fatalities have been reported at all wind farms investigated in the U.S. across a wide range of habitats

Predicting Bat Fatalities at proposed wind projects has been problematic; pre-project measures of abundance have not been predictive of impacts



Common Results for Bats from all studies:

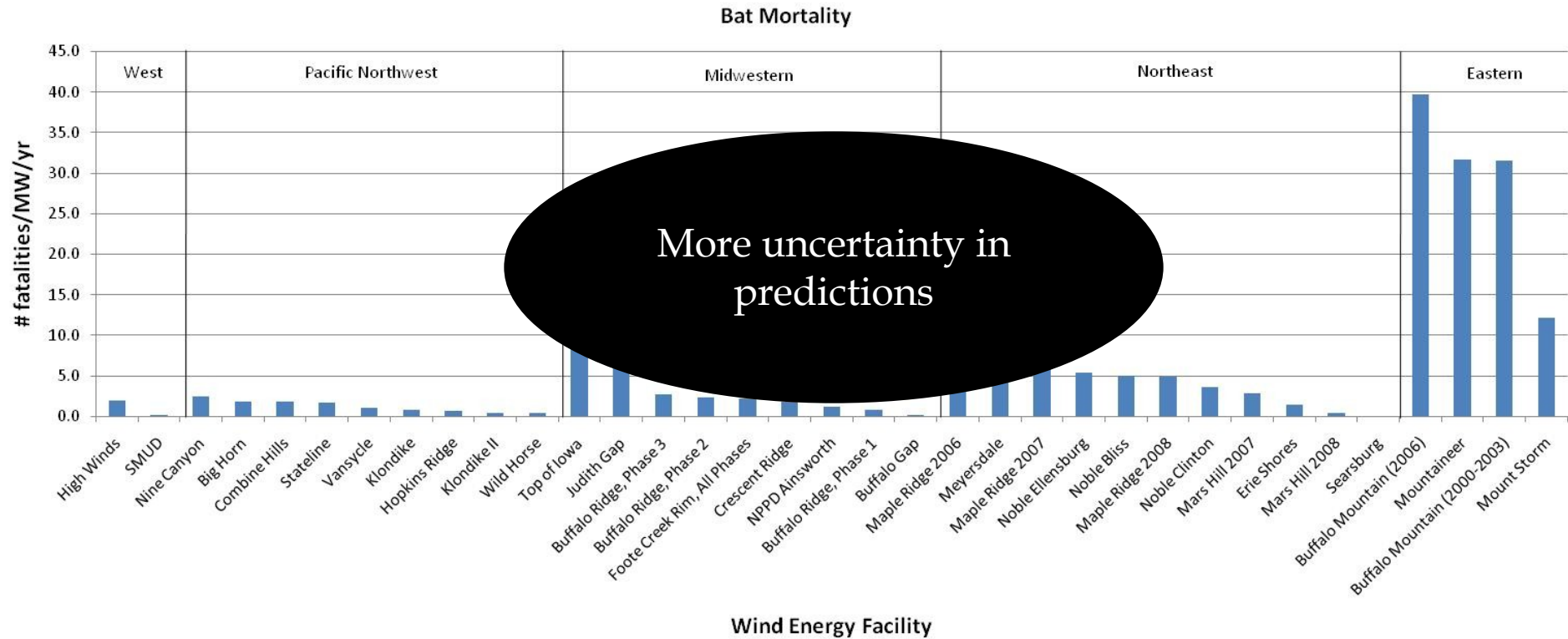
- Impacts are unequal across species, season, and locality.
- Most mortality occurs in late summer and autumn; >50% of all recorded bat fatalities have been in August.
- Mortality appears to be highest along forested ridgelines but there have been high numbers reported for other ecotypes as well.
- Mortality of spring and summer resident bats is not as high as late summer /fall.

Common Results for Bat from all studies:

- Most mortality involves solitary tree-roosting long-distance migrant species.



Bat Mortality

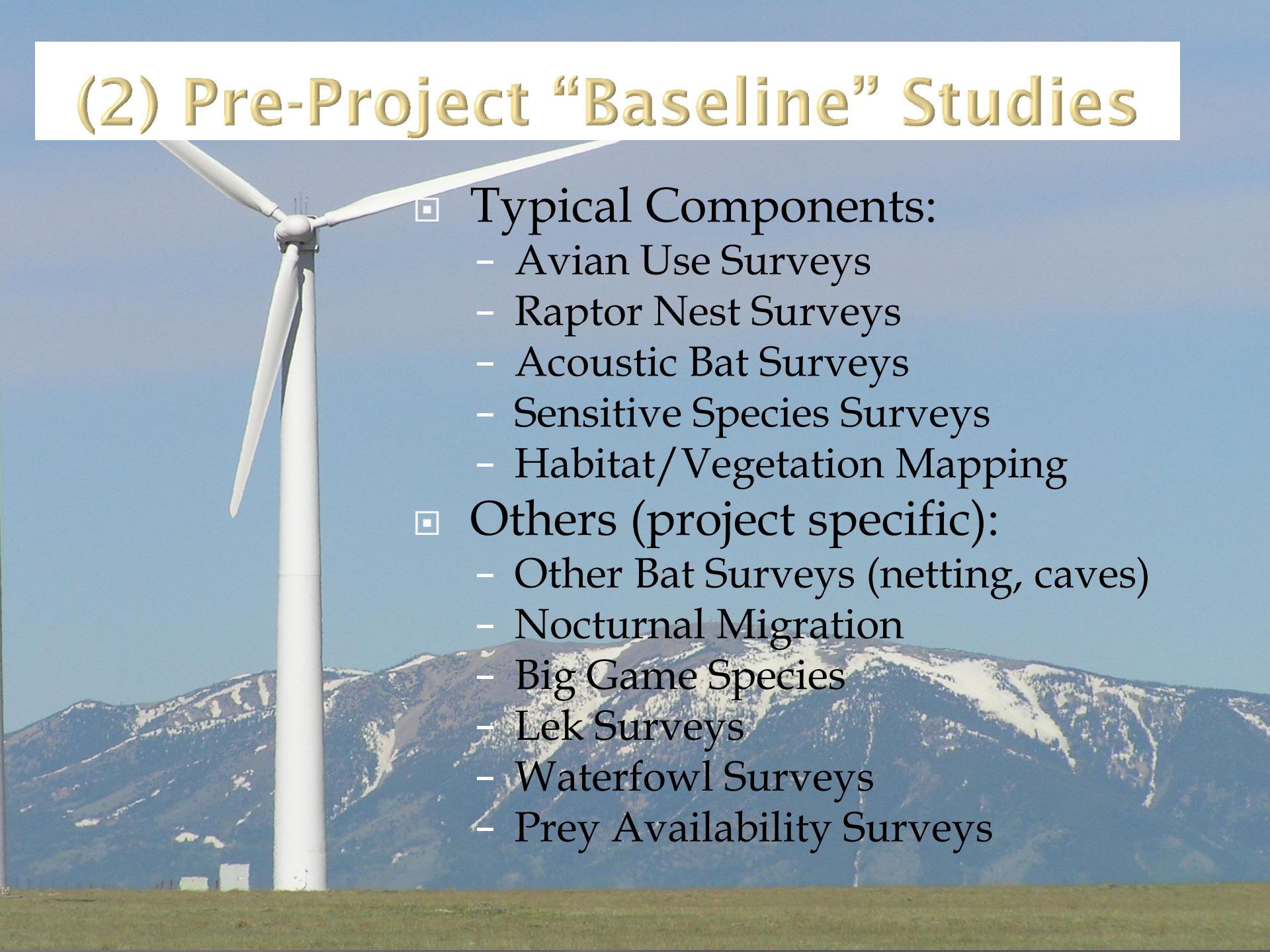


PRE-CONSTRUCTION STUDY OBJECTIVES

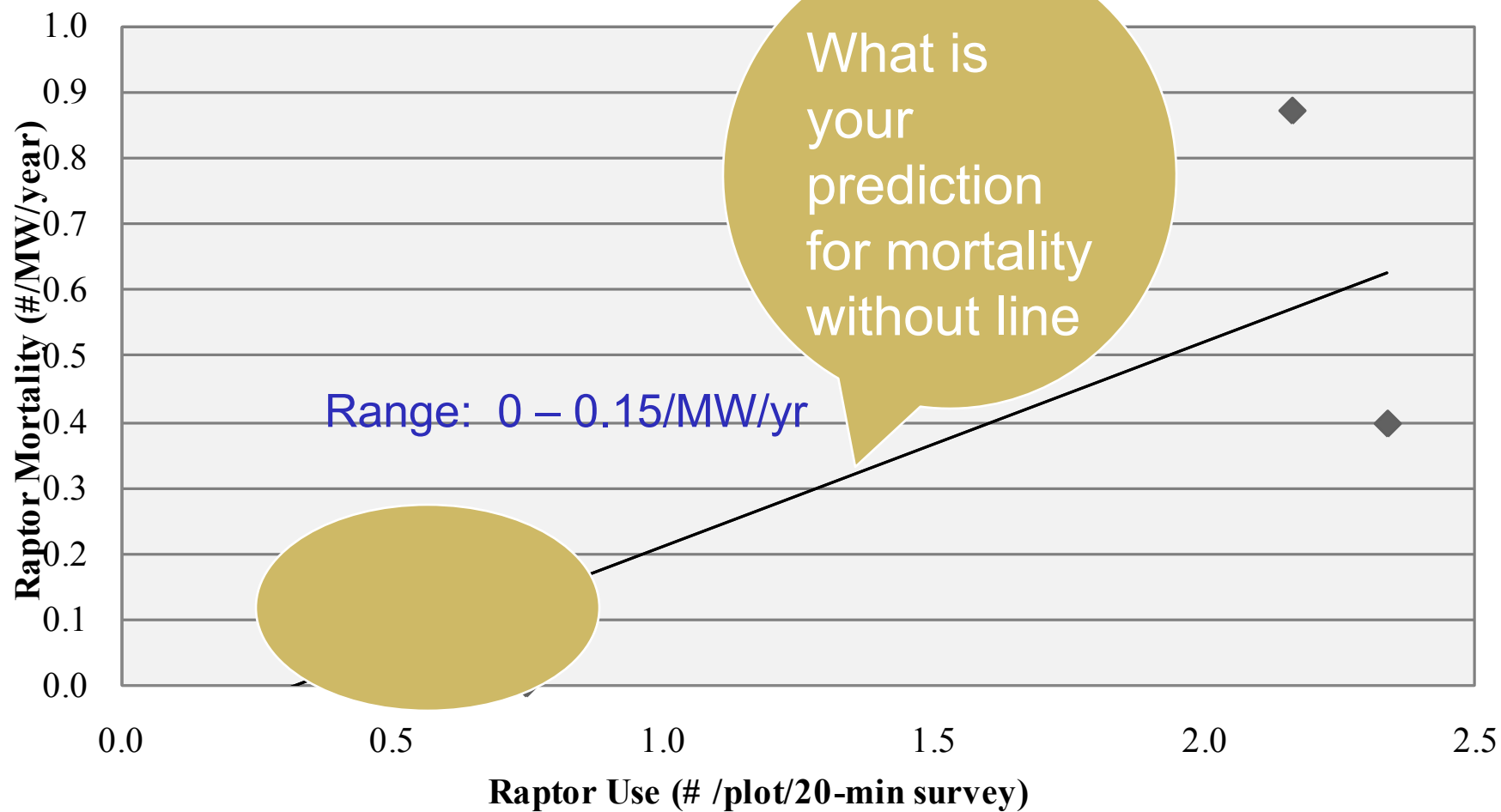
1. Provide site specific data useful in estimating potential impacts of proposed projects.
2. Provide site specific data useful in project planning – macro- and micro-scale siting; construction timing; conservation measures; etc.
3. Provide recommendations for further studies, potential mitigation, and/or monitoring.
4. Data needs to be tied to impacts, not for the sake of collecting data

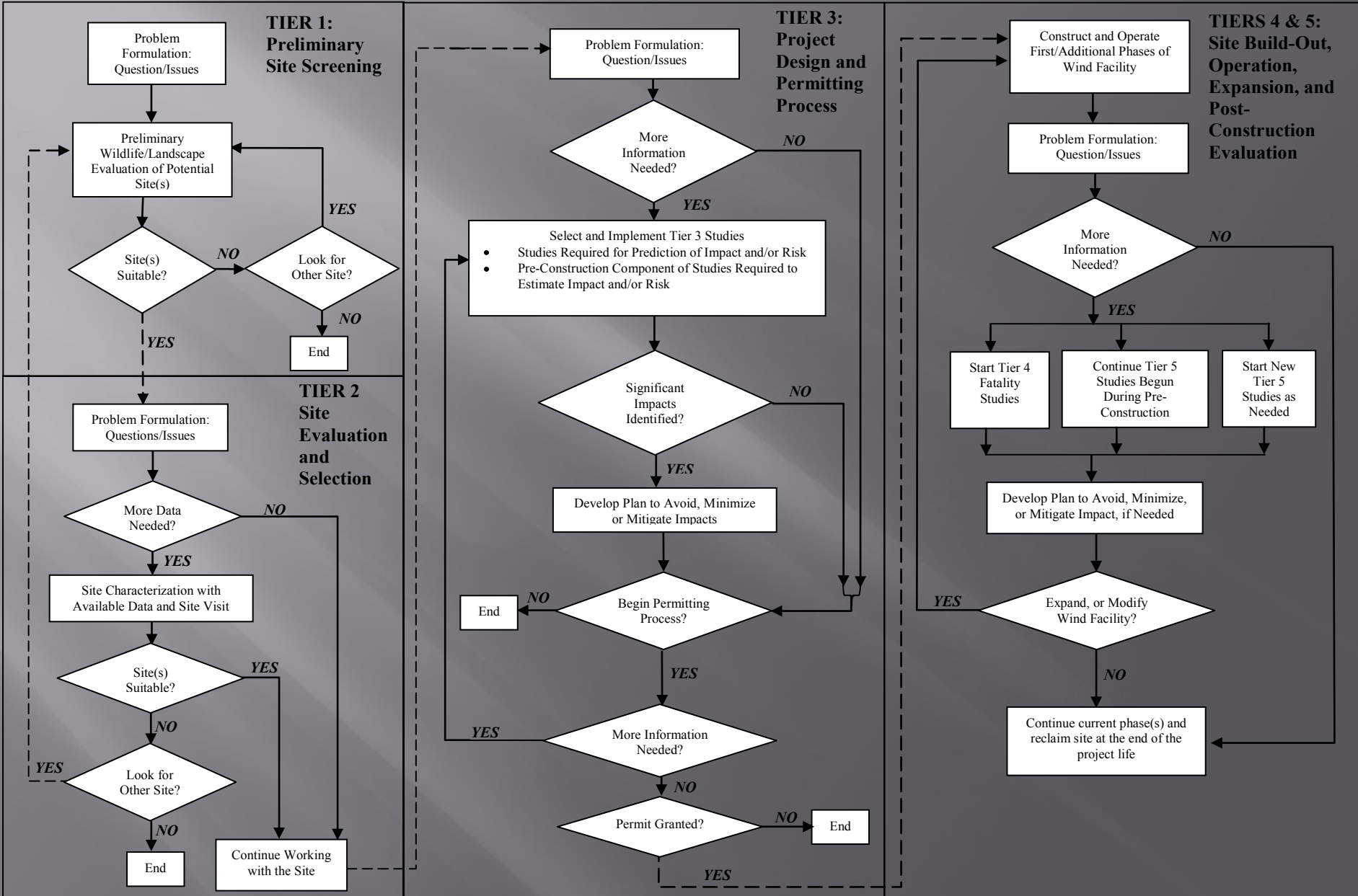


(2) Pre-Project “Baseline” Studies

- 
- ▣ Typical Components:
 - Avian Use Surveys
 - Raptor Nest Surveys
 - Acoustic Bat Surveys
 - Sensitive Species Surveys
 - Habitat/Vegetation Mapping
 - ▣ Others (project specific):
 - Other Bat Surveys (netting, caves)
 - Nocturnal Migration
 - Big Game Species
 - Lek Surveys
 - Waterfowl Surveys
 - Prey Availability Surveys

Regression
 $y = 0.308x - 0.099$
 $R^2 = 69.9\%$

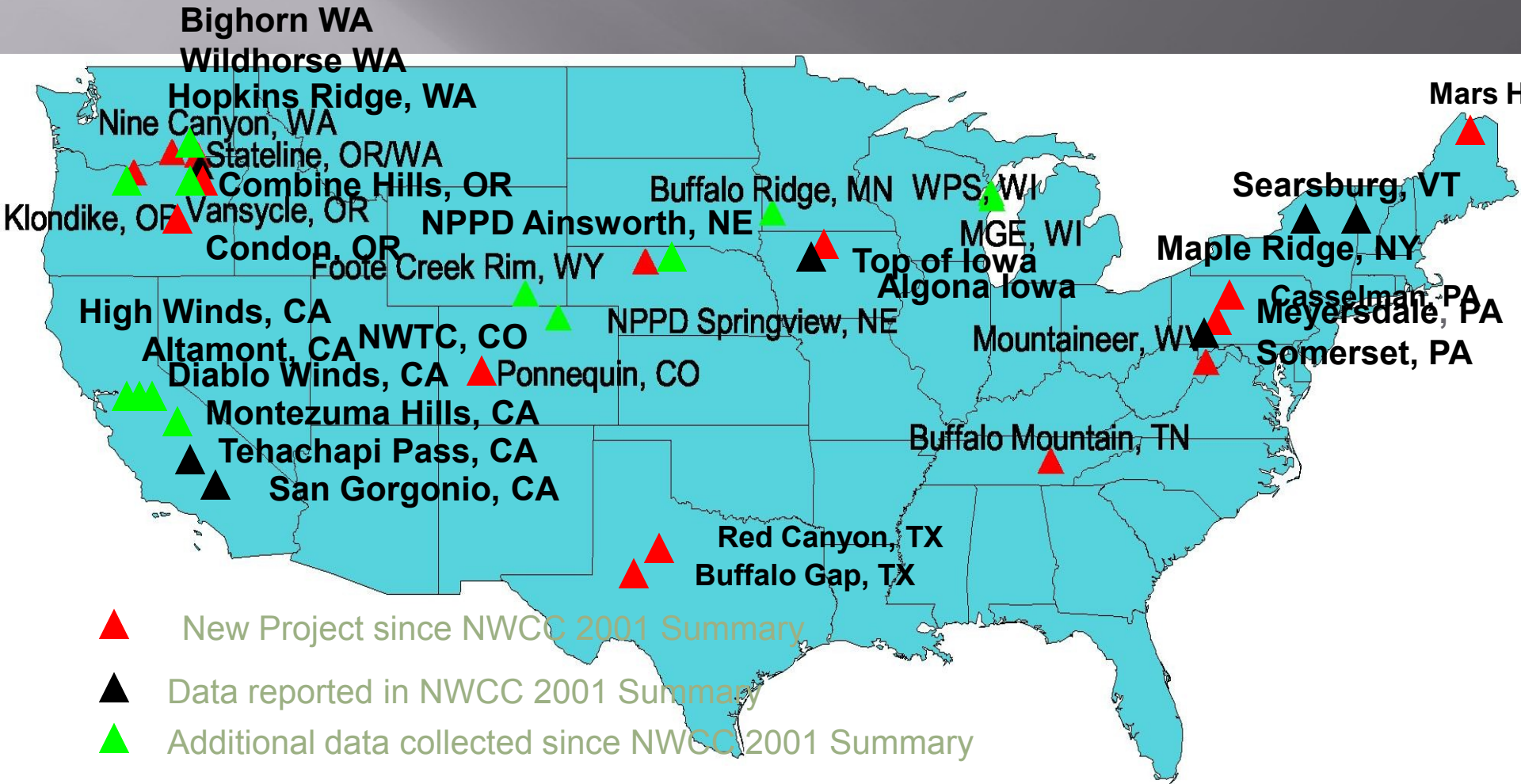




KEY:

- Decision point
- Action
- > Action between Tiers
- > Action within Tier

Fatality Monitoring Studies



Cumulative Fatality Impacts Illustration

- ▣ Col. Plateau Ecoregion/OR&WA
- ▣ 6,000 MW built or planned
- ▣ 77,000 RTHA in CPE
 - juv mort – 54%, adult – 20%
 - Wind turbine kills 0.05% – 0.2%
- ▣ 170,000 AMKE in CPE
 - Juv mort – 69%, adult - 45%
 - Wind turbine kills ~0.05% - 0.2%
- ▣ 1,000 FEHA
 - Juv mort - ~60%, adult – 24%
 - Wind turbine kills <1-2%



Adaptive Management

- ▣ Always some uncertainty in estimating impacts
- ▣ More certain in classifying projects in terms of relative impacts
 - LOW: 0.01 – 0.15 raptors/mw/yr, 1 – 4 birds/mw/yr
 - MED: 0.15 – 0.3 raptors /mw/yr, 4 – 10 birds/mw/yr
 - HIGH: >0.3 raptors /mw/yr, >10 birds/mw/yr
- ▣ More uncertainty with bat impacts in some regions
 - Pre-construction surveys not guaranteed to be predictor of post-construction mortality

Data/Research Needs

- ▣ Impacts to Sage Grouse and Other Prairie Grouse
 - Oil and gas impacts may not be surrogate for wind energy impacts
- ▣ Bat Mortality
 - Connection between pre-construction surveys and post-construction mortality not there yet
 - For high mortality cases, curtailment may be a cost-effective option
 - “what level of mortality is significant”
- ▣ Refined approaches for addressing cumulative impacts

